

OBSTETRIC AND NEONATAL ADVERSE EVENTS AND ASSOCIATION WITH CARE MODELS: A COHORT STUDY

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ABSTRACT

Objective: to analyze the prevalence of practices in childbirth care, obstetric and neonatal adverse events and their association with care models in three public health services.

Method: this is a prospective cohort study carried out with 548 dyads, postpartum women and their newborns, whose pregnancy was of usual risk and vaginal birth, admitted to hospital in three public services, one with an exclusive care model by nurse-midwives (service A), one with a collaborative model involving obstetric doctors and nurses (service B) and one with an exclusive medical care model (service C). Initially, an interview was carried out with participants, and a second contact was carried out 42 days after birth to complement the collection of the adverse event outcome.

Results: in service A, no woman underwent the Kristeller maneuver, episiotomy, directed pushing or more than one vaginal examination per hour. Meanwhile, in service C, 19.3%, 39.9%, 77.1% and 26.3% of women underwent these interventions, respectively. Adverse events occurred in 19.2% of the dyads. Occurrence of adverse events was associated with not using partograph ($p=0.001$; OR: 11.03; CI: 2.64-45.99) and episiotomy ($p=0.042$; OR: 1.72; CI: 1.02-2.91). The mean probability of experiencing an adverse event was 5% in service A, 21% in service B and 24% in service C.

Conclusion: adverse events had a lower mean probability of occurrence in the service exclusively operated by nurse-midwives, in which greater application of recommendations for labor and birth care was identified.

DESCRIPTORS: Humanizing delivery. Nurse midwives. Near miss. Healthcare. Healthcare models. Benchmarking.

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EVENTOS ADVERSOS OBSTÉTRICOS E NEONATAIS E ASSOCIAÇÃO COM OS MODELOS DE ASSISTÊNCIA: UM ESTUDO COORTE

RESUMO

Objetivo: analisar a prevalência de práticas na atenção ao parto, eventos adversos obstétricos e neonatais e sua associação com modelos assistenciais em três serviços de saúde públicos.

Método: estudo coorte prospectivo realizado com 548 binômios, puérperas e seus recém-nascidos, cuja gestação foi de risco habitual e o parto vaginal, internados em três serviços públicos, sendo um com modelo de assistência exclusivo por enfermeiras obstetras (serviço A), um com modelo colaborativo com atuação de médicos e enfermeiras obstetras (serviço B) e um com modelo de assistência exclusiva médica (serviço C). Inicialmente, foi realizada uma entrevista com as participantes e um segundo contato foi realizado após 42 dias do parto para complementar a coleta do desfecho evento adverso.

Resultados: no serviço A, nenhuma mulher foi submetida à manobra de Kristeller, episiotomia, incentivos a puxos dirigidos ou mais de um toque vaginal por hora. Enquanto, no serviço C, 19,3%, 39,9%, 77,1% e 26,3% das mulheres foram submetidas a essas intervenções, respectivamente. Os eventos adversos ocorreram em 19,2% dos binômios. A ocorrência dos eventos adversos foi associada ao não uso do partograma ($p=0,001$; OR:11,03; IC:2,64-45,99) e episiotomia ($p=0,042$; OR:1,72; IC:1,02-2,91). A probabilidade média de apresentar algum evento adverso foi de 5% no serviço A, 21% no serviço B e 24% no serviço C.

Conclusão: os eventos adversos apresentaram menor probabilidade média de ocorrência no serviço com atuação exclusiva de enfermeiras obstetras, no qual se identificou maior aplicação das recomendações para assistência ao parto e nascimento.

DESCRIPTORES: Parto humanizado. Enfermeiros obstetras. Potencial evento adverso na assistência à saúde. Modelos de assistência à saúde. Análise de boas práticas.

EVENTOS ADVERSOS OBSTÉTRICOS Y NEONATALES Y ASOCIACIÓN CON MODELOS DE ATENCIÓN: UN ESTUDIO DE COHORTE

RESUMEN

Objetivo: analizar la prevalencia de prácticas en la atención del childbirth, eventos adversos obstétricos y neonatales y su asociación con los modelos de atención en tres servicios públicos de salud.

Método: estudio de cohorte prospectivo realizado con 548 binomios, puérperas y sus recién nacidos, cuyo embarazo fue de riesgo habitual y childbirth vaginal, hospitalizados en tres servicios públicos, uno con modelo de atención exclusiva por enfermeras obstétricas (servicio A), otro con modelo colaborativo. modelo con la labor de médicos y enfermeras obstetras (servicio B) y otro con un modelo de asistencia médica exclusiva (servicio C). Inicialmente se realizó una entrevista a los participantes y se realizó un segundo contacto a los 42 días del nacimiento para complementar la recopilación del resultado del evento adverso.

Resultados: en el servicio A ninguna mujer fue sometida a maniobra de Kristeller, episiotomía, pujo dirigido o más de un examen vaginal por hora. Mientras tanto, en el servicio C, el 19,3%, 39,9%, 77,1% y 26,3% de las mujeres se sometieron a estas intervenciones, respectivamente. Los eventos adversos ocurrieron en el 19,2% de los binomios. La aparición de eventos adversos se asoció con la no utilización del partographa ($p=0,001$; OR:11,03; IC:2,64-45,99) y episiotomía ($p=0,042$; OR:1,72; IC:1,02-2,91). La probabilidad promedio de experimentar un evento adverso fue del 5% en el servicio A, del 21% en el servicio B y del 24% en el servicio C.

Conclusión: los eventos adversos tuvieron menor probabilidad promedio de ocurrencia en el servicio operado exclusivamente por enfermeras obstétricas, en el que se identificó mayor aplicación de las recomendaciones de asistencia al childbirth y nacimiento.

DESCRIPTORES: Childbirth humanizado. Enfermeras obstetricas. Near miss salud. Modelos de atención de salud. Bechmarking.

INTRODUCTION

In recent decades, health indicators have shown a significant improvement in childbirth and birth care, with prospects for changes in maternal and neonatal care in Brazil. However, limitations remain in the application of good practices based on scientific evidence and their incorporation by health professionals and services, when there are high rates of episiotomy and Kristeler maneuver performance¹.

In obstetrics, the majority of women are classified as being at normal risk and receive support from health professionals in the normal and physiological processes of pregnancy. Even so, they are no less susceptible to adverse events. As controversial as it may seem, a patient's clinical worsening may be linked to health professionals' actions, who have the role of caring/curing. This is the concept of adverse event, which is temporary or permanent damage caused to patients due to errors and failures in care practice. In the field of obstetric care, it seems that human error is no less prevalent².

In Brazil, the most common obstetric care model still presents the inadequate use of interventions, such as the adoption of a lithotomy position and the use of a continuous peripheral venous catheter during childbirth labor, in addition to refusing authorization for the presence of a companion at labor and childbirth¹. The interventionist model used in the physiological processes of childbirth brings women's dissatisfaction, in addition to adverse outcomes¹.

To significantly reduce such harmful practices, the adoption of scientific evidence in the practice of obstetric care is recommended. However, the insertion of these practices in the care field requires more than knowledge and convictions; it is a collective and multidisciplinary search for changing attitudes, being open to new knowledge, filling gaps in knowledge transfer and overcoming obstacles³.

In the search to change this scenario, the inclusion of nurse-midwives is one of the Ministry of Health's efforts to reduce the use of unnecessary interventions and cesarean sections. Its presence at childbirth increases the satisfaction of women assisted, without harming perinatal indicators, as pointed out by some studies⁴⁻⁵.

It was observed that the insertion of nursing-midwifery in hospitals reduced clearly harmful practices, contributing to favorable outcomes in the childbirth and birth process⁶. Similar results were found in studies that compared models of obstetric care, in which these professionals work exclusively, with services in which only some of them or only doctors work⁷.

However, few studies have analyzed the perspective of patient safety in the scope of obstetric care and the use of recommended practices⁸⁻¹⁰. When considering that the work of nurse-midwives provides changes in obstetric care through the use of less interventionist practices, a lower incidence of adverse events could possibly also be observed. Therefore, given this gap in knowledge and a relevant demand to analyze childbirth and birth care from the perspective of patient safety, it was decided to carry out the present study. Therefore, the objective was to analyze the prevalence of practices in childbirth care, obstetric and neonatal adverse events and their association with care models in three public health services.

METHOD

This is a prospective cohort study structured according to the STROBE checklist recommendations. Participants were postpartum women whose pregnancy was of usual risk and the childbirth was vaginal. The study sites were three public obstetric and neonatal care services in the Federal District (FD), Brazil, which only serve patients from the Brazilian Health System (*Sistema Único de Saúde*). The locations were: a Normal Peri-Hospital Birth Center, a place where nurse-midwives work exclusively,

called service A in the present study; a tertiary care hospital, where nurse-midwives work only during the day in collaboration with doctors, called service B; and a tertiary care hospital with exclusive work by doctors in obstetric and neonatal care, called service C. Each service belongs to a different health region in the FD.

The sample was composed of dyads, postpartum women and their newborns (NB), admitted to the study sites' joint accommodation, during childbirth, from April to August 2019. For sample calculation, the sample size was used as a basis number of usual-risk childbirths recorded at each of the study sites in the last four months of the previous year. In services B and C, it was estimated that 90% of childbirths were of usual risk. In service A, collection took longer to achieve a minimum sample that would enable comparative statistical calculations with other services. Considering a sampling error of 5%, a confidence level of 95% and a prevalence of 30%, the sample was initially estimated at 107 participants in service A, 284 in service B and 260 in service C. Women were excluded with usual risk pregnancies undergoing cesarean section in services B and C, because the surgery itself would increase the risk of an adverse event. Thus, the sample in these services was 228 and 213, respectively.

As inclusion criteria, the following were considered: postpartum women over 18 years of age; with a gestational age ≥ 37 weeks of vaginal childbirth who were classified as a usual risk pregnancy according to national guidelines and service protocol; that is; single pregnancy; up to four previous normal childbirths; uneventful prenatal care; labor with spontaneous onset; active fetal movement; cephalic presentation; fetal heartbeat within normal limits with good variability; uterine contractions within normal limits; preserved uterine tone; clear amniotic fluid with lumps; when present; vaginal bleeding of light intensity corresponding to the cervical dilation phase; expulsive period within normal limits for mother and fetus. Women undergoing cesarean section were excluded.

Postpartum women were invited to participate during their hospital admission in the joint accommodation of the three institutions, simultaneously, to carry out the interview. All postpartum women who met the inclusion criteria were invited. There were five refusals, three in service B and two in service C, which were replaced by inviting other postpartum women, until the desired sample was reached.

In the first contact with the postpartum woman, a face-to-face interview was carried out guided by an instrument for data collection: (1) sociodemographic: age ($<$ or ≥ 35 years), self-declared skin color (brown/black/yellow or white), years of study ($<$ or \geq high school), marital status (married/stable union or single/divorced/widowed), mean family income in reais (\leq or $>$ US\$ 516.80), place of residence; (2) aspects of access to the health service: offering and carrying out a prior visit to the reference childbirth location (yes or no); (3) characteristics of obstetric and neonatal care during childbirth and post-childbirth, with all answers categorized as yes or no: childbirth in non-lithotomy position, freedom to walk, received diet at labor, companion of free choice, spray bath available, received massage, bobath ball available, skin-to-skin contact in the 1st hour of life, breastfeeding in the 1st hour of life, use of continuous peripheral venous access, electronic cardiotocography > 20 minutes, Kristeller maneuver, incentives for directed pushing.

More than one vaginal examination per hour, use of partograph, episiotomy, intravenous oxytocin, lacerations and degrees (1st, 2nd, 3rd or 4th) were collected from the postpartum woman's medical records.

Variables relating to prenatal care characteristics were collected from the pregnant woman's card. They were number of prenatal consultations ($<$ or ≥ 6), gestational age at the beginning of prenatal care (\leq or > 12 weeks), planned pregnancy (yes or no), previous pathologies (yes or no),

pathologies during pregnancy (yes or no). The baby's weight, 1st and 5th minute Apgars were collected from the child's record book.

Adverse events were considered based on the list of sentinel events, which are the most serious harmful events that must be reported to regulatory agencies because they require immediate and corrective action². The sentinel events defined by the Brazilian National Health Regulatory Agency (*Agência Nacional de Vigilância Sanitária*) are: (1) maternal events: maternal death, scheduled elective childbirth, undiagnosed breech presentation before the expulsion period, shoulder dystocia, unplanned maternal readmission within 14 days, maternal cardiopulmonary arrest, resuscitated, in-hospital initiation of antibiotics 24 hours or more after a vaginal childbirth, unplanned organ removal, injury or repair (includes hysterectomy), hemorrhage requiring transfusion, eclampsia, unplanned return to the childbirth or surgery room for some intervention, 3rd and 4th degree perineal lacerations, venous thromboembolism, uterine rupture, anesthetic complications, admission to the Intensive Care Unit (ICU) on site or transferred; (2) fetal/neonatal events: fetal and neonatal deaths weighing ≥ 500 g, birth of a child < 32 weeks in an institution without a Neonatal ICU, transfer of a NB to a Neonatal ICU in another institution, Apgar score < 7 at the 5th minute, tocotrauma, fetal injury in cesarean section, neonatal convulsions, NB weighing more than 2,500 g admitted to the Neonatal ICU, undiagnosed fetal anomaly; (3) organizational events: records not available, delay in responding to a call for care, equipment failure, conflict regarding the handling of a case, user complaint, medication error, compress/instrument retention, healthcare-related infection, violation of local protocol, maternal stay one day longer than the local standard after vaginal childbirth and cesarean section, childbirth not assisted by a qualified person¹¹. World Health Organization recommendations were used to categorize obstetric and neonatal care as recommended or not recommended/recommended in a specific context¹².

Adverse events were the outcomes analyzed in the present study, characterized as occurrence or not of a sentinel event that occurred with the postpartum woman and her NB since childbirth. Those that occurred during childbirth and birth were collected from medical records, the pregnant woman's card or the child's card. Subsequently, the investigation into occurrence of adverse event continued in a second contact with the same postpartum women, carried out by telephone, after the end of the period classified as puerperium (42 days after childbirth). Data were collected from medical records to complement and qualify the sentinel adverse events identified.

The collected data were entered and analyzed in the Statistical Package for the Social Sciences (SPSS) version 26.0. For data analysis, measures of central tendency and dispersion were performed for quantitative data and the absolute and relative frequency of qualitative data. Then, the chi-square test was used to analyze statistical differences in NBs' weight and 5th minute Apgar scores and postpartum woman sociodemographic characteristics from the three services. Fisher's exact test was used to analyze statistical differences between obstetric and neonatal care practices and services.

A stepwise forward multiple logistic regression model was performed after a multicollinearity study of variables. The response variable was occurrence of adverse event. Practices not recommended or recommended in a specific context with $p \leq 0.25$ (non-use of partograph, continuous intravenous access, more than one vaginal touch per hour, Kristeller maneuver, encouragement of directed pushing, episiotomy and use of intravenous oxytocin) were tested in the multiple model. In this analysis, no distinction was made between services, so the practices of the three services were analyzed together.

Furthermore, the mean of estimated probabilities of occurrence of adverse event was calculated in dyads in each service and, at the end, the comparative test of means (Tukey test) was applied. Statistical significance was considered when $p < 0.05$.

This research was approved by the Research Ethics Committee, as recommended by Resolution 466/2012 of the Brazilian National Health Council for research with human beings. Participants were invited to participate and acceptance was registered by signing the Informed Consent Form.

RESULTS

The total sample consisted of 548 participants, 107 from service A (19.5%), 228 from service B (41.6%) and 213 from service C (38.9%). Women's mean age was 26.5 years (standard deviation 6.0 years) and ranged from 18 to 49 years.

The following characteristics were presented by the majority of postpartum women, such as unplanned pregnancy (65.2%), no previous pathologies (94.9%) and no pathologies in this pregnancy (74.5%).

Primary care was the main place for prenatal care (97.8%) and at least six consultations were carried out (76.0%) starting within 12 weeks for 63.9% (Table 1). Most postpartum women were not offered a prior visit to the reference childbirth location (68.5%). Among those offered this opportunity, 18.1% made the visit.

NBs had, on average, 3,229.8 g of birth weight (standard deviation 413.2 g) and 96.9% had more than 2,500 g of birth weight. Apgar scores lower than 7 at the 1st minute occurred in 4.2% of NBs, and at the 5th minute, in 0.2%. There was no statistically significant difference in the three services in relation to NBs' weight ($p = 0.403$) and Apgar score at the 5th minute ($p = 0.584$).

Table 1 – Sociodemographic data and prenatal characteristics of postpartum women assisted in three public health services. Brasília, FD, Brazil, 2019.

Variables/categories	Total N (%)	Service A N (%)	Service B N (%)	Service C N (%)	p-value*
Age group (N=548)					0.120
< 35 years	486 (88.7)	91 (85.0)	199 (87.3)	196 (92.0)	
≥ 35 years	62 (11.3)	16 (15.0)	29 (12.7)	17 (8.0)	
Self-declared skin color (N=548)					0.003
White	102 (18.6)	32 (29.9)	33 (14.5)	37 (17.4)	
Brown/black/yellow	446 (81.4)	75 (70.1)	195 (85.5)	176 (82.6)	
Years of study (N = 548)					0.158
< High school	135 (24.6)	29 (27.1)	63 (27.6)	43 (20.2)	
≥ Complete high school	413 (75.4)	78 (72.9)	165 (72.4)	170 (79.8)	
Marital status (N = 548)					0.241
Married/stable union	423 (77.2)	84 (78.5)	168 (73.7)	171 (80.3)	
Single/divorced/widowed	125 (22.8)	23 (21.5)	60 (26.3)	42 (19.7)	
Mean family income (N=452)					0.019
≤ US\$ 516.80	307 (67.9)	58 (57.4)	137 (73.7)	112 (67.9)	
> US\$ 516.80	145 (32.1)	43 (42.6)	49 (26.3)	53 (32.1)	
Number of prenatal care appointments (N=509)					0.028
< 6	122 (24.0)	10 (12.8)	54 (24.1)	58 (28.0)	
≥ 6	387 (76.0)	68 (87.2)	170 (75.9)	149 (72.0)	
GA† in the beginning of prenatal care (N=504)					<0.001
≤ 12 weeks	322 (63.9)	84 (79.2)	128 (64.0)	110 (55.6)	
> 12 weeks	182 (36.1)	22 (20.8)	72 (36.0)	88 (44.4)	

*Chi-square test; †Gestational age.

In relation to sociodemographic variables, there were statistically significant differences in the skin color of women, identifying a higher percentage of white women in service A, compared to services B ($p=0.001$) and C ($p=0.010$). Women in service A had a higher mean family income than those in service B ($p=0.005$), but there was no difference in relation to women in service C ($p=0.085$). There was no difference in mean family income between women in service B and C ($p=0.234$). Regarding aspects of prenatal care, a higher percentage of women in service A had at least six consultations, compared to those in service B ($p=0.037$) and service C ($p=0.008$). Starting prenatal care within 12 weeks was more prevalent among women in service A, compared to those in services B ($p=0.006$) and C ($p<0.001$).

Service A had a higher frequency of applying recommended care practices than services B and C ($p<0.001$) as well as practically not using non-recommended or recommended practices in a specific context (Table 2). Service B had less use of continuous venous access ($p<0.001$), more than one vaginal examination per hour ($p<0.001$), Kristeller maneuver, incentives for directed pushing ($p<0.001$) and episiotomy ($p<0.001$) than service C, except for the use of intravenous oxytocin ($p=0.096$) and electronic cardio-fetal monitoring >20 minutes ($p=0.935$) where no difference was found between the two services.

Table 2 – Obstetric and neonatal care practices received by postpartum women and their newborns during care in three public health services. Brasília, FD, Brazil, 2019.

Variables	Total N (%)	Service A N (%)	Service B N (%)	Service C N (%)	p-value*
Recommended practices					
Childbirth in non-lithotomy position (N=548)	376 (68.6)	104 (97.2)	108 (47.4)	164 (77.0)	<0.001
Freedom to walk (N=548)	486 (88.7)	107 (100.0)	202 (88.6)	177 (83.1)	<0.001
Received a diet at labor (N=526)	350 (66.5)	104 (97.2)	130 (59.4)	116 (58.0)	<0.001
Companion free to choose (N=534)	434 (81.3)	107 (100.0)	154 (70.3)	173 (83.2)	<0.001
Spray bath available (N=527)	395 (75.0)	105 (98.1)	166 (75.5)	124 (62.0)	<0.001
Received massage (N=530)	197 (37.2)	47 (44.3)	80 (36.2)	70 (34.5)	0.220
Bobath ball available (N=527)	352 (66.8)	101 (97.1)	108 (48.9)	143 (70.8)	<0.001
Use of partograph (N=548)	96 (17.5)	92 (86.0)	3 (1.3)	1 (0.5)	<0.001
Skin-to-skin contact 1 st hour of life (N=543)	403 (74.2)	101 (96.2)	210 (92.5)	92 (43.6)	<0.001
Breastfeeding 1 st hour of life (N=544)	341 (62.7)	100 (95.2)	139 (61.5)	102 (47.9)	<0.001
Practices not recommended or recommended in a specific context					
Use of continuous venous access (N=532)	211 (39.7)	0	90 (40.5)	121 (59.6)	<0.001
Electronic cardiotocography >20 minutes (N=534)	58 (10.9)	0	30 (13.5)	28 (13.7)	<0.001
+ 1 vaginal touch per hour (N=519)	74 (14.3)	0	22 (10.3)	52 (26.3)	<0.001
Kristeller maneuver (N=532)	55 (10.3)	0	15 (6.8)	40 (19.3)	<0.001
Incentives for directed pushing (N=532)	243 (45.7)	0	85 (38.6)	158 (77.1)	<0.001
Episiotomy (N=548)	101 (18.4)	0	16 (7.0)	85 (39.9)	<0.001
Intravenous oxytocin (N=548)	99 (18.1)	10 (9.3)	39 (17.1)	50 (23.5)	0.007

*Fisher's exact test.

Regarding perineal lacerations, 1st or 2nd degree lacerations occurred in 50.7% of childbirths, with a higher prevalence in service A (64.5%) compared to service B (56.6%). and service C (37.6%). Thus, 3rd or 4th degree lacerations occurred in 1.1% of childbirths, with one occurrence in service A, two in service B and three in service C.

A total of 125 adverse events were identified in 105 dyads in the sample (19.2%), considering that some dyads had more than one adverse event. All dyads were investigated within the established deadline and no occurrence of other adverse events was identified, such as maternal, fetal or neonatal death, maternal cardiorespiratory arrest, resuscitation, or uterine rupture. The most prevalent outcomes were NBs weighing > 2,500 g admitted to the Neonatal ICU, undiagnosed fetal anomaly and maternal hemorrhage requiring transfusion (Table 3).

In the comparison of multiple means carried out using the Tukey test, a higher mean probability of presenting an adverse event in vaginal childbirth dyads in service C was identified (Table 4). Non-use of partograph and the practice of episiotomy were associated with the adverse event outcome in the multiple logistic regression model (Table 5).

Table 3 – Types of adverse events in postpartum women and newborns treated at three public health services. Brasília, FD, Brazil, 2019. (n=548)

Adverse events	N	%
Newborn weighing more than 2,500 g admitted to the Neonatal Intensive Care Unit	58	46.4
Undiagnosed fetal anomaly	15	12.0
Maternal bleeding requiring transfusion	12	9.6
In-hospital antibiotic initiation 24 hours or more after a vaginal childbirth	08	6.4
Tocotraumatism	08	6.4
3 rd and 4 th degree perineal lacerations	06	4.8
Unplanned return to the childbirth or surgery room for an intervention	04	3.2
Unplanned organ removal, injury, or repair	03	2.4
Eclampsia	02	1.6
Anesthetic complications	02	1.6
Local protocol violation	02	1.6
Venous thromboembolism	01	0.8
Unplanned maternal readmission within 14 days	01	0.8
Maternal admission to the Intensive Care Unit	01	0.8
Apgar score < 7 at the 5 th minute in newborns	01	0.8
Delay in responding to a call for care	01	0.8

Table 4 – Prevalence of adverse events in dyads and estimated mean probability of adverse event by public health service in the Federal District. Brasília, FD, Brazil, 2019. (n=548)

Variable	Total	Service A	Service B	Service C	p-value*
Adverse event					
Yes	105 (19.2%)	2 (1.9%)	41 (18.0%)	62 (29.1%)	-
No	443 (80.8%)	105 (98.1%)	187 (82.0%)	151 (70.9%)	-
Probability of adverse event	-	5%	21%	24%	<0.001

*Tukey test

Table 5 – Care practices not recommended or recommended in a specific context received by postpartum women and their newborns during care in three public health services associated with adverse events. Brasília, FD, Brazil, 2019. (n=548)

	Simple model*		Multiple model*	
	p-value	Adjusted OR	95% CI	Adjusted p-value
Non-use of partograph	<0.001	11.55	2.77-48.09	< 0.001
Use of continuous venous access	0.004	0.89	0.52-1.51	0.665
+ 1 vaginal touch per hour	0.049	1.20	0.65-2.20	0.560
Kristeller maneuver	0.022	1.68	0.87-3.22	0.120
Incentives for directed pushing	<0.001	1.21	0.74-1.99	0.442
Episiotomy	0.001	1.70	1.01-2.86	0.045
Intravenous oxytocin	0.049	1.40	0.81-2.43	0.227

*Logistic regression simple model and multiple model (adjusted). Variables included in adjusted analysis were non-use of partograph, continuous intravenous access, more than one vaginal examination per hour, Kristeller maneuver, encouragement of directed pushing, episiotomy and use of intravenous oxytocin.

DISCUSSION

The results of this study demonstrated differences in the practice of obstetric and neonatal care in the three services studied, according to the care model used, showing that occurrences of adverse events were associated with not using partograph and performing an episiotomy, in addition to being more likely to occur in services with greater use of obstetric and neonatal practices not recommended or recommended in a specific context.

Regarding sociodemographic data, there was a statistically significant difference between the services. In services B and C, whose results demonstrate less application of good practices in childbirth and birth, there is a greater number of self-declared brown and black patients. Furthermore, patients in service B had a lower mean family income. A national study points out that social inequities still persist in access to good practices in labor and childbirth management, despite having reduced since the Stork Network implementation¹³. Another study also found a greater number of prenatal consultations in women with white skin color and higher income¹⁴. However, maternal age ≥ 35 years and lower education, which are characteristics associated with greater gestational risk¹⁵⁻¹⁶, showed no difference between services. From this, it is important to consider that differences in the characteristics of postpartum women in each service may have influenced the use of different care practices in childbirth.

Regarding care models, the best results were obtained in the application of good practices, in the exclusive care of nursing-midwifery, in all aspects, when compared to the two other services. Other studies presented similar results, showing that nursing-midwifery uses fewer interventions in care¹⁷, respecting the role of women in childbirth, assisting them with a greater amount of good practices^{7,18}, which highlights the importance of this professional's role in the childbirth and birth scenario.

It is important to highlight the following data, which corroborate the previous statement in service A: all patients had their right to the presence of a companion of their choice throughout their hospital admission respected; no patient underwent episiotomy, had continuous peripheral venous access, had continuous fetal cardiac monitoring for more than 20 consecutive minutes, received the Kristeller maneuver, was encouraged to perform directed pushing or received more than one vaginal touch per hour.

The results from service B demonstrate that the partial insertion of nurse-midwives only during daytime periods may have contributed to reducing the frequency of practices not recommended or recommended in a specific context. Furthermore, it is believed that this insertion also helped to identify greater application of good practices, such as breastfeeding and skin-to-skin contact in the first hour of life.

The presence of a companion at childbirth has been essential in promoting changes in professional conduct, avoiding routine practices¹⁹. Their presence mitigates social inequalities and increases the use of non-pharmacological methods for pain relief, such as massages, greater receipt of analgesia and choice of position for childbirth²⁰. Possibly, the presence of a companion contributed to the application of good obstetric practices, since, in service A, all patients had a companion and a greater frequency in the use of good practices.

Regarding partograph use, service A used it much more frequently than services B and C. In these services, the frequency of using this tool was much lower than services studied in another national-based study¹. Despite being a simple tool, its use requires good implementation in the service and in the work process²¹. However, in the present study, not using partograph was associated with a greater chance of adverse events. Probably, its non-use may explain the higher percentage of interventions in services B and C, which may have resulted in more adverse events.

In relation to the recommendation of early breastfeeding and skin-to-skin contact throughout the first hour of life, the highest adherence by service A stands out, in which skin-to-skin contact presented a similar percentage to high-income countries²². The longest duration of skin-to-skin contact was observed in childbirths assisted by nurse-midwives in another study²³. Skin-to-skin contact has beneficial effects on breastfeeding, as it increases the duration and success of the first lactation²⁴.

Service B showed greater adoption of the lithotomy position than services A and C. This position should be avoided, due to the possible increased risk of severe perineal lacerations and episiotomy²⁵, in addition to longer labor, greater pain and more fetal heart rate abnormalities²⁶.

Regarding perineal lacerations, there was a higher prevalence of 1st and 2nd degree lacerations in service A, when compared to other services. This occurred because no episiotomies were performed in service A. Service C had a higher prevalence of episiotomies, corroborating the greater chance of being subjected to this procedure if the woman is assisted to by professionals other than nurses²⁷.

The prevalence of episiotomy has reduced in several countries around the world²⁸ and the more restricted use of this procedure in instrumental childbirth has not been associated with an increase in obstetric injuries to the anal sphincter²⁹. Additionally, a review study found that episiotomy may increase the risk of tears, dyspareunia, and post-childbirth perineal pain³⁰. In the present study, the use of episiotomy increased the chance of an adverse event. This reinforces the importance of carefully assessing the use of this procedure.

Regarding adverse events, there was a greater probability of occurrence in the service with greater use of non-recommended or recommended practices in a specific context, which was also verified in another study⁸. This is probably related to the greater use of interventions during care for postpartum women and NBs. However, it is not possible to establish a direct cause and effect relationship, because the adverse event outcome is preventable damage resulting from a chain of events and must be differentiated from a known complication². To make this distinction, root cause analysis is needed to elucidate the factors that may have led to the damage³¹. This level of precision was not realized in the present study.

In this study, around a fifth of the usual-risk childbirth dyads developed an adverse event. A Swedish study carried out with women after vaginal childbirth showed a lower percentage (12.2%)³²

and a Brazilian study with women undergoing cesarean section showed a similar percentage of adverse events (21.0%)³³. However, another Brazilian study identified a percentage of 31.3% of postpartum complications in postpartum women in an obstetric service with a medicalized care model³⁴. In the present study, the most frequent adverse event was the admission of NBs weighing more than 2,500 g to the Neonatal ICU, as in another Brazilian study³³.

The distinctions in the percentages of adverse events in these studies can be explained by the chosen scenario, characterized or not by an interventionist profile in obstetric care, and by differences in the parameters to classify obstetric adverse events².

Among the limitations of this study, it is important to highlight that the distinctions in sociodemographic characteristics and prenatal care resulted in heterogeneity between the groups compared, which may have influenced the results. Another limitation was the participants' bias in reporting occurrence of the sentinel event via telephone.

The short follow-up time of the study is also highlighted as a limitation considering that the investigation of an adverse event such as maternal death, for instance, must occur within one year after childbirth³⁵. Another limiting aspect was the lack of description of adverse events in the medical records, which hindered their identification and/or classification. This was possibly due to the punitive culture, making more in-depth analyzes of its causes and outcomes difficult as well as retrospective studies with root cause analysis. Furthermore, the lack of standardization in parameters to classify adverse events makes comparison with other studies difficult. All these aspects make it difficult to generalize the results.

As strengths, the present results add valid results on obstetric care and reinforce the benefits of including nurse-midwives with a likely lower prevalence of adverse events resulting from these professionals' practice.

CONCLUSION

The study presented occurrence of obstetric adverse events in postpartum women and their NBs from vaginal births and usual risk pregnancies. There was a lower mean probability of these events occurring in the service where nurse-midwives work exclusively, in which greater application of recommendations for labor and birth care was identified.

The use of these recommendations in obstetric and neonatal care occurred with different prevalences in the three public health services studied in the FD. Failure to use the childbirth graph and performing an episiotomy were associated with occurrence of obstetric and neonatal adverse events.

These results suggest that a multidisciplinary and cohesive approach to applying recommended practices in the maternal and neonatal field could possibly reduce these adverse events.

REFERENCES

1. Leal MC, Bittencourt SA, Esteves-Pereira AP, Ayres BVS, Silva LBRAA, Thomaz EBAF, et al. Progress in childbirth care in Brazil: Preliminary results of two evaluation studies. *Cad Saúde Pública* [Internet]. 2019 [cited 2023 Apr 09];35(7):e00223018. Available from: <https://doi.org/10.1590/0102-311X00223018>
2. Pettker CM. Systematic approaches to adverse events in obstetrics, Part I: Event identification and classification. *Semin Perinatol* [Internet]. 2017 [cited 2023 Apr 09];41(3):151-5. Available from: <https://doi.org/10.1053/j.semperi.2017.03.003>
3. Côrtes CT, Oliveira SMJV, Santos RCS, Francisco AA, Riesco MLG, Shimoda GT. Implementation of evidence-based practices in normal delivery care. *Rev Latino-Am Enfermagem* [Internet]. 2018 [cited 2023 Apr 09];26:e2988. Available from: <https://doi.org/10.1590/1518-8345.2177.2988>

4. Gama SGN, Viellas EF, Medina ET, Tuesta AA, Silva CKRT, Silva SD, et al. Delivery care by obstetric nurses in maternity hospitals linked to the Rede Cegonha, Brazil – 2017. *Ciênc Saúde Colet* [Internet]. 2021 [cited 2023 Apr 09];26(3):919-29. Available from: <https://doi.org/10.1590/1413-81232021263.28482020>
5. Alves TCM, Coelho ASF, Sousa MC, Cesar NF, Silva OS, Pacheco LR. Contributions of the obstetrical nursing for the good practices in labor and vaginal delivery. *Enferm Foco* [Internet]. 2019 [cited 2023 Apr 09];10(4):54-60. Available from: <https://doi.org/10.21675/2357-707X.2019.v10.n4.2210>
6. Silva F, Nucci M, Nakano AR, Teixeira L. “Ideal childbirth”: Medicalization and construction of a hospital delivery assistance script in Brazil in mid-20th century. *Saúde Soc* [Internet]. 2019 [cited 2023 Apr 09];28(3):171-84. Available from: <http://doi.org/10.1590/S0104-12902019180819>
7. Silva TPR, Dumont-Pena E, Sousa AMM, Amorim T, Tavares LC, Nascimento DCP, et al. Obstetric nursing in best practices of labor and delivery care. *Rev Bras Enferm* [Internet]. 2019 [cited 2023 Apr 09];72(3):235-42. Available from: <https://doi.org/10.1590/0034-7167-2018-0561>
8. Sousa KM, Pimenta IDSF, Fernández Elorriaga M, Saturno-Hernandez PJ, Rosendo TMSS, de Freitas MR, et al. Multicentre cross-sectional study on adverse events and good practices in maternity wards in Brazil and Mexico: Same problems, different magnitude. *BMJ Open* [Internet]. 2019 [cited 2023 Apr 09];9(12):e030944. Available from: <https://doi.org/10.1136/bmjopen-2019-030944>
9. Sousa KM, Saturno-Hernández PJ, Rosendo TMSS, Freitas MR, Molina RL, Medeiros WR, et al. Impact of the implementation of the WHO Safe Childbirth Checklist on essential birth practices and adverse events in two Brazilian hospitals: a before and after study. *BMJ Open* [Internet]. 2022 [cited 2023 Apr 09];12:e056908. Available from: <https://doi.org/10.1136/bmjopen-2021-056908>
10. Rodrigues GT, Pereira ALF, Pessanha PSA, Penna LHG. Incidents in the care provided to parturient women and newborns: The perspective of nurses and physicians. *Esc Anna Nery* [Internet]. 2021 [cited 2023 Apr 09];25(2):e20200075. Available from: <https://doi.org/10.1590/2177-9465-EAN-2020-0075>
11. Agência Nacional de Vigilância Sanitária (BR). Serviços de Atenção Materna e Neonatal: Segurança e Qualidade. Brasília: ANVISA; 2014 [cited 2023 Apr 09]. Available from: https://portaldeboaspraticas.iff.fiocruz.br/wp-content/uploads/2018/12/Manual_Seguranca_MATERNA_12112014_FINAL.pdf
12. World Health Organization (WHO). WHO recommendations Intrapartum care for a positive childbirth experience [Internet]. 2018 [cited 2023 Apr 09]. Available from: <https://apps.who.int/iris/bitstream/handle/10665/272447/WHO-RHR-18.12-eng.pdf>
13. Leal MC, Esteves-Pereira AP, Vilela MEA, Alves MTSSBE, Neri MA, Queiroz RCS, et al. Reduction of inequities of access to appropriate childbirth care in Rede Cegonha. *Ciênc Saúde Colet* [Internet]. 2021 [cited 2023 Apr 09];26(3):823-35. Available from: <https://doi.org/10.1590/1413-81232021263.06642020>
14. Mario DN, Rigo L, Boclin KLS, Malvestio LMM, Anziliero D, Horta BL, et al. Quality of prenatal care in Brazil: National Health Research 2013. *Ciênc Saúde Colet* [Internet]. 2019 [cited 2023 Apr 09];24(3):1223-32. Available from: <https://doi.org/10.1590/1413-81232018243.13122017>
15. Pinheiro RL, Areia AL, Mota Pinto A, Donato H. Advanced maternal age: Adverse outcomes of pregnancy, a meta-analysis. *Acta Med Port* [Internet]. 2019 [cited 2023 Sep 04];32(3):219-26. Available from: <https://doi.org/10.20344/amp.11057>
16. Garcia EM, Martinelli KG, Gama SGN, Oliveira AE, Esposti CDD, Santos Neto ET. Gestational risk and social inequalities: a possible relationship? *Ciênc Saúde Colet* [Internet]. 2019 [cited 2023 Sep 04];24(12):4633-42. Available from: <https://doi.org/10.1590/1413-812320182412.31422017>

17. Merz WM, Tascon-Padron L, Puth MT, Heep A, Tietjen SL, Schmid M, et al. Maternal and neonatal outcome of births planned in alongside midwifery units: A cohort study from a tertiary center in Germany. *BMC Pregnancy Childbirth* [Internet]. 2020 [cited 2023 Apr 09];20(1):267. Available from: <https://doi.org/10.1186/s12884-020-02962-4>
18. de Souza K, da Silva T, Damasceno A, Manzo BF, Souza KV, Filipe M, et al. Coexistence and prevalence of obstetric interventions: An analysis based on the grade of membership. *BMC Pregnancy Childbirth* [Internet]. 2021 [cited 2023 Apr 09];21(1):618. Available from: <https://doi.org/10.1186/s12884-021-04092-x>
19. Alves MTSSB, Chagas DC, Santos AM, Simões VMF, Ayres BVS, Santos GLS. Racial inequality in obstetric good practices and interventions in labor and birth care in Rede Cegonha. *Ciênc Saúde Colet* [Internet]. 2021 [cited 2023 Apr 09];26(3):837-46. Available from: <https://doi.org/10.1590/1413-81232021263.38982020>
20. Tomasi YT, Saraiva SS, Boing AC, Delziovio CR, Wagner KJP, Boing AF. From prenatal care to childbirth: A cross-sectional study on the influence of a companion on good obstetric practices in the Brazilian National Health System in Santa Catarina State, 2019. *Epidemiol Serv Saúde* [Internet]. 2021 [cited 2023 Apr 09];30(1):e2020383. Available from: <https://doi.org/10.1590/S1679-49742021000100014>
21. Lavender T, Bernitz S. Use of the partograph – Current thinking. *Best Pract Res Clin Obstet Gynaecol* [Internet]. 2020 [cited 2023 Apr 09];67:33-43. Available from: <https://doi.org/10.1016/j.bpobgyn.2020.03.010>
22. Abdulghani N, Edvardsson K, Amir LH. Worldwide prevalence of mother-infant skin-to-skin contact after vaginal birth: A systematic review. *PLoS One* [Internet]. 2018 [cited 2023 Apr 09];13(10):e0205696. Available from: <https://doi.org/10.1371/journal.pone.0205696>
23. Kuamoto RS, Bueno M, Riesco MLG. Skin-to-skin contact between mothers and full-term newborns after birth: A cross-sectional study. *Rev Bras Enferm* [Internet]. 2021 [cited 2023 Apr 09];74(Suppl 4):e20200026. Available from: <https://doi.org/10.1590/0034-7167-2020-0026>
24. Karimi FZ, Sadeghi R, Maleki-Saghooni N, Khadivzadeh T. The effect of mother-infant skin to skin contact on success and duration of first breastfeeding: A systematic review and meta-analysis, *Taiw J Obst Gynecol* [Internet]. 2019 [cited 2023 Apr 09];58(1):1-9. Available from: <https://doi.org/10.1016/j.tjog.2018.11.002>
25. Rocha BD, Zamberlan C, Pivetta HMF, Santos BZ, Antunes BS. Upright positions in childbirth and the prevention of perineal lacerations: A systematic review and meta-analysis. *Rev Esc Enferm USP* [Internet]. 2020 [cited 2023 Apr 09];54:e03610. Available from: <https://doi.org/10.1590/S1980-220X2018027503610>
26. Huang J, Zang Y, Ren LH, Li FJ, Lu H. A review and comparison of common maternal positions during the second-stage of labor. *Int J Nurs Sci* [Internet]. 2019 [cited 2023 Apr 09];6(4):460-7. Available from: <https://doi.org/10.1016/j.ijnss.2019.06.007>
27. Aguiar BM, Silva TPR, Pereira SL, Sousa AMM, Guerra RB, Souza KV, et al. Factors associated with the performance of episiotomy. *Rev Bras Enferm* [Internet]. 2020 [cited 2023 Apr 09];73(Suppl 4):e20190899. Available from: <https://doi.org/10.1590/0034-7167-2019-0899>
28. Clesse C, Lighezzolo-Alnot J, De Lavergne S, Hamlin S, Scheffler M. Socio-historical evolution of the episiotomy practice: A literature review. *Women Health* [Internet]. 2019 [cited 2023 Apr 09];59(7):760-74. Available from: <https://doi.org/10.1080/03630242.2018.1553814>
29. Gachon B, Fritel X, Rivière O, Pereira B, Vendittelli F. French guidelines for restrictive episiotomy during instrumental delivery were not followed by an increase in obstetric anal sphincter injury. *Sci Rep* [Internet]. 2022 [cited 2023 Apr 09];12(1):6330. Available from: <https://doi.org/10.1038/s41598-022-10379-6>

30. Ghulmiyyah L, Sinno S, Mirza F, Finianos E, Nassar AH. Episiotomy: History, present and future – a review. *J Matern Fetal Neonatal Med* [Internet]. 2022 [cited 2023 Apr 09];35(7):1386-91. Available from: <https://doi.org/10.1080/14767058.2020.1755647>
31. Pettker CM. Systematic approaches to adverse events in obstetrics, Part II: Event analysis and response. *Semin Perinatol* [Internet]. 2017 [cited 2023 Apr 09];41(3):156-60. Available from: <https://doi.org/10.1053/j.semperi.2017.03.004>
32. Skoogh A, Hall-Lord ML, Bååth C, Bojö AS. Adverse events in women giving birth in a labor ward: A retrospective record review study. *BMC Health Serv Res* [Internet]. 2021 [cited 2023 Apr 09];21(1):1093. Available from: <https://doi.org/10.1186/s12913-021-07109-5>
33. Oliveira TC, Lucena TS, Silva JMO, Nagliate PC, Veríssimo RCSS, Sales MLH. Adverse outcomes of childbirth in high-risk maternity hospitals. *Rev Bras Saude Mater Infant* [Internet]. 2020 [cited 2023 Apr 09];20(1):193-201. Available from: <https://doi.org/10.1590/1806-93042020000100011>
34. Monteschio LVC, Marcon SS, Santos RMS, Vieira VCL, Oliveira MD, Goes HLF, et al. Puerperal complications in a medicalized model of childbirth care. *Rev Min Enferm* [Internet]. 2020 [cited 2023 Apr 09];24:e1319. Available from: https://cdn.publisher.gn1.link/reme.org.br/pdf/en_e1319.pdf
35. Ministério da Saúde. 2009. Secretaria de Vigilância em Saúde. Departamento de Análise de Situação em Saúde. Guia de vigilância epidemiológica do óbito materno. Brasília: Ministério da Saúde; 2009 [cited 2023 Sep 04]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/guia_vigilancia_epidem_obito_materno.pdf

NOTES

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CONFLICT OF INTEREST

There is no conflict of interest.

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